Also, national societies of medical physicists and RTTs have been addressed in order to gather information regarding legal requirements in the different countries.
Through the dissemination of the results from these surveys, and an associated literature review, the goal of this task group is to make radiotherapy professionals familiar with industrial quality management tools, and how these methods can be applied in our field. It is our hope that this may help optimising time and resources spent on quality assurance procedures within radiotherapy in the future.

OC-0329

Extension of a commercial R&V system to improve safety and efficiency of library-based plan-of-the-day strategies

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Purpose/Objective: With a library-based plan-of-the-day (POTD) strategy, several patient-specific plans are created with the same dose prescription in order to account for day-to-day anatomical variations in target shape and position. Currently, commercial record & verify (R&V) systems lack dedicated tools to efficiently and safely perform these treatments. The purpose of this work was to develop and implement a novel software tool in our R&V software (MOSAIQ, Elekta AB) in order to improve safety and efficiency in library-based POTD workflows.
Materials and Methods: An extensive risk analysis of the library-based POTD procedure in our institution was performed to reveal potential risks in the clinical workflow during the treatment preparation and execution phase. Of major concern was excessive dose delivery. In the original procedure, all POTD plans were simultaneously scheduled in the R&V system and non-selected plans had to be removed manually. Furthermore, we identified deviations from the normal clinical workflow, such as adding plans in case the treatment course was started with an incomplete plan library or continuing with a completely renewed plan library. From all these analyses, logical checks on patient eligibility, dose administration and dose delivery were devised. These checks were put in a logical order in a decision tree and used to design a novel software tool to deal safely with all possible clinical situations. The tool has been developed using IQ-scripting in MOSAIQ in close collaboration with Elekta.
Results: The developed IQ-script is executed at the start of every treatment. Protocol-specific tags are attached to POTD plans to specify that a patient is on a POTD protocol. When all subsequent checks are passed, a straightforward plan selection dialogue is shown to the RTT. Upon confirmation of the selected plan, the appropriate fields are inserted in today's treatment session. Otherwise, a warning or error dialogue is displayed, and, depending on the severity of the violation, dose delivery is prevented or user intervention is required to continue treatment. For non-POTD patients, the script exits immediately when no tags are found. Extensive testing was done in MOSAIQ 2.5 by mimicking situations that may occur in clinical practice, including treatment continuation after an interrupt within a field or fraction. The software tool has been in clinical use since October 2014.
Conclusions: We demonstrated the feasibily of IQ-scripting to extent the R&V system for improved safety and efficiency in library-based plan-of-the-day strategies. This tool paths the way to a wide-spread implementation of those strategies and to more advanced library-based approaches including dynamic plan-library updates.

OC-0330

Statistical process control for quality assurance of patient positioning during head-and-neck radiotherapy

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Purpose/Objective: Correct and consistent patient positioning is extremely important when highly conformal dose distributions are delivered using VMAT. Therefore, the application of Statistical Process Control (SPC) may be useful for the quality control of patient positioning. SPC has been widely used as a quality management tool to monitor manufacturing processes in industry since the 1950's. However, only a limited number of SPC applications within radiotherapy have been reported in literature since the first papers on this subject around 2000. This study investigates the application of SPC for the quality control of patient positioning during head and neck radiotherapy.
Materials and Methods: More than 100 Head and Neck cancer patients treated in the last 2.5 years were included in this study. On average 7 CBCT scans per patient were sequentially registered using each of the following match structures: C1-C3, C3-C5, C5-C7, C7-caudal, the larynx, mandible, jugular notch and occipital bone. This enabled quantification of the patient deformation during treatment by calculating the position of each structure relative to C1-C3. So-called 'Individual Values', 'Moving Range', and 'Exponentially Weighted Moving Average' SPC charts were used to retrospectively analyse improvements in patient deformation over time which were observed after the instigation of a multi-disciplinary working group. In addition, SPC charts were used to monitor deformation during the treatment of the subsequent patient cohort, as well as for monitoring the positioning accuracy of individual patients.
Results:

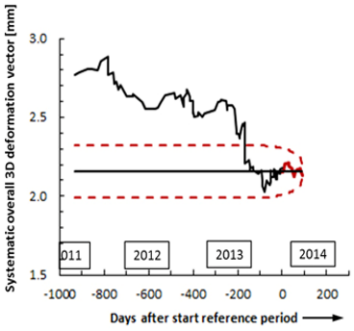

Fig. 1: Exponentially Weighted Moving Average (EWMA) SPC chart of the systematic overall 3D-deformation vector. Red solid line: data from reference period used to calculate process limits (red dashed lines). Black line: data to analyse from preceding time period.

SPC charts showed that a significant and consistent improvement in patient positioning has been achieved since the instigation of the multi-disciplinary working group. Fig.1 shows how the magnitude and the variation of the average systematic 3D-deformation vector decreased from 3.0 ± 0.9 mm (1 S.D.) in 2011 to 2.2 ± 0.4 mm (1 S.D.) in the first 3 months of 2014. Further analysis of the data revealed that the application of a different type of head rest, and re-training of staff members in mask-making were key factors in improving patient positioning. Continued monitoring of the results from April 2014 onwards showed that the patient deformation was well within the process limits for most patients, which indicated that the improvements are consistent. However, the results for two patients exhibited larger deviations that could be attributed to exceptional circumstances for these two patients. These observations